Video-Based Sensor Networks

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Video-**Based Sensor Networks**

- Video streaming
  - RTP
- Networking
  - Multi-hop/Ad-hoc
- Transport Systems
  - IEEE 802.11b
    - DSSS
    - FHSS
- Implementations
  - SPW software implementation to evaluate the network deign
  - iPAQ based experimental setup for real-time demo

Multi-hop Sensor Networks

Requirements;

- ***Energy efficient***
- ***Scalable***

For an efficient and robust system IEEE 802.11 FHSS is considered.

Implementations & Demos

SPW implementation of 801.11b FHSS

- for evaluating the performance of the physical layer under various mobility conditions.
- receiver design with Viterbi equalizer for 2GFSK, 4GFSK, and 8GFSK signals
- Antenna Diversity
- Transmission of video bitstreams
- Effect of packet loss on the recovered video

Multi-hop ad-hoc Networks

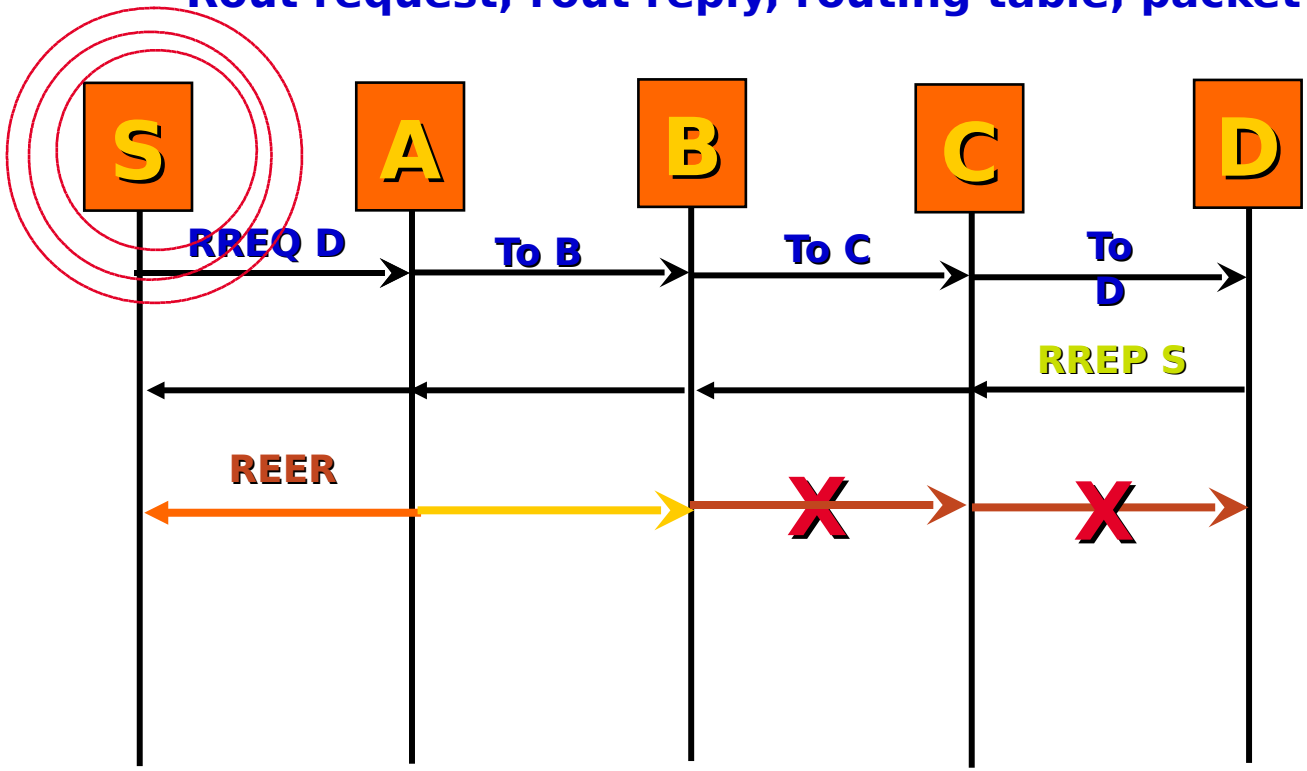
- AODV (Ad-hoc on-demand Distance Vector) routing.
- DSR (Dynamic Source Routing)
- Sensoria Multi-hop Network (WIN NG 2.0)
- NIST Approach

AODV

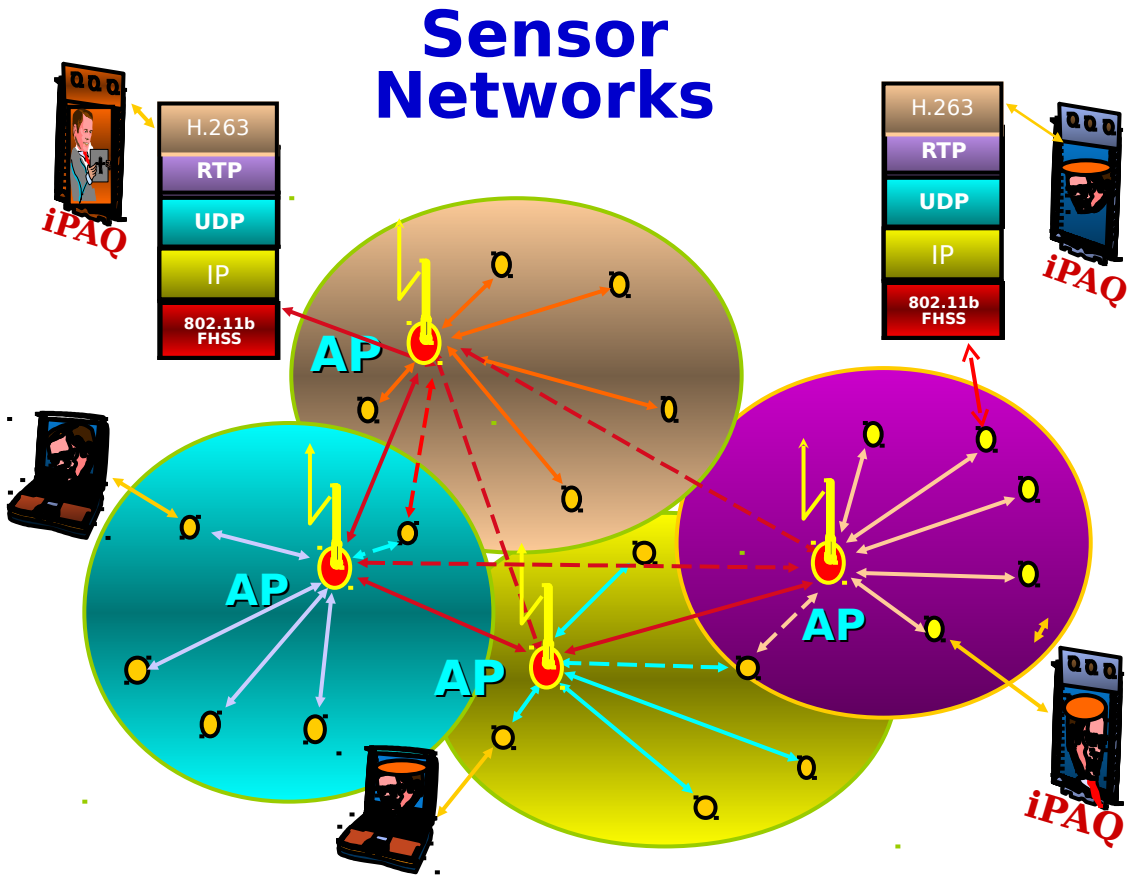
It provides loop free routes using sequence numbers associated to each route.

AODV MODULES consists of:

Rout request, rout reply, routing table, packet resend, packet capture



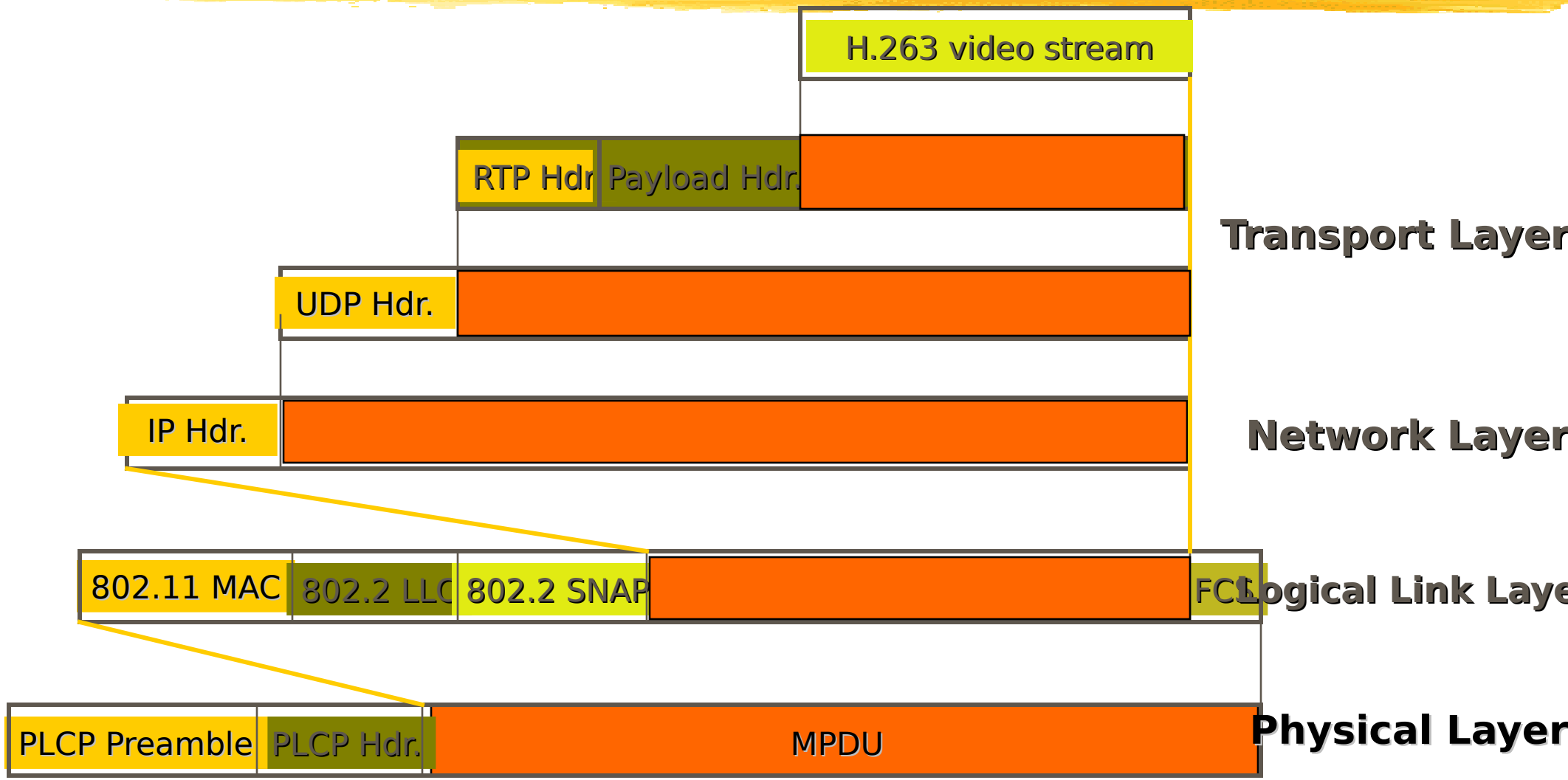
Sensor Ad-hoc Networking (NIST Demo)



Video Streaming

- VIC/RTP package
- VIC on iPAQ (Linux)
- Applied H.263+ compression for low bitrate video conferencing
- Developed H.263+-based Error resilient video decoding
  - Partitioned
  - Non-partitioned
- RTP/UDP for low delay video conferencing

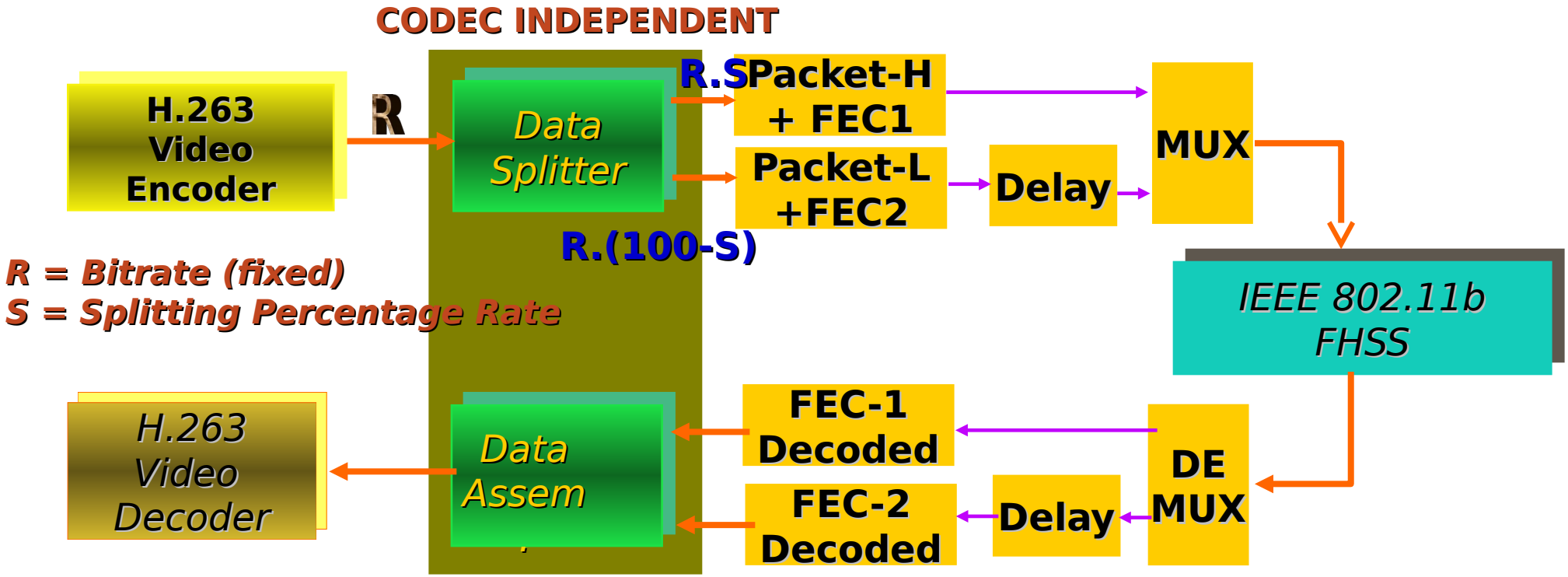
Frame Format for video stream transmitted by RTP/UDP/IP with IEEE 802.11



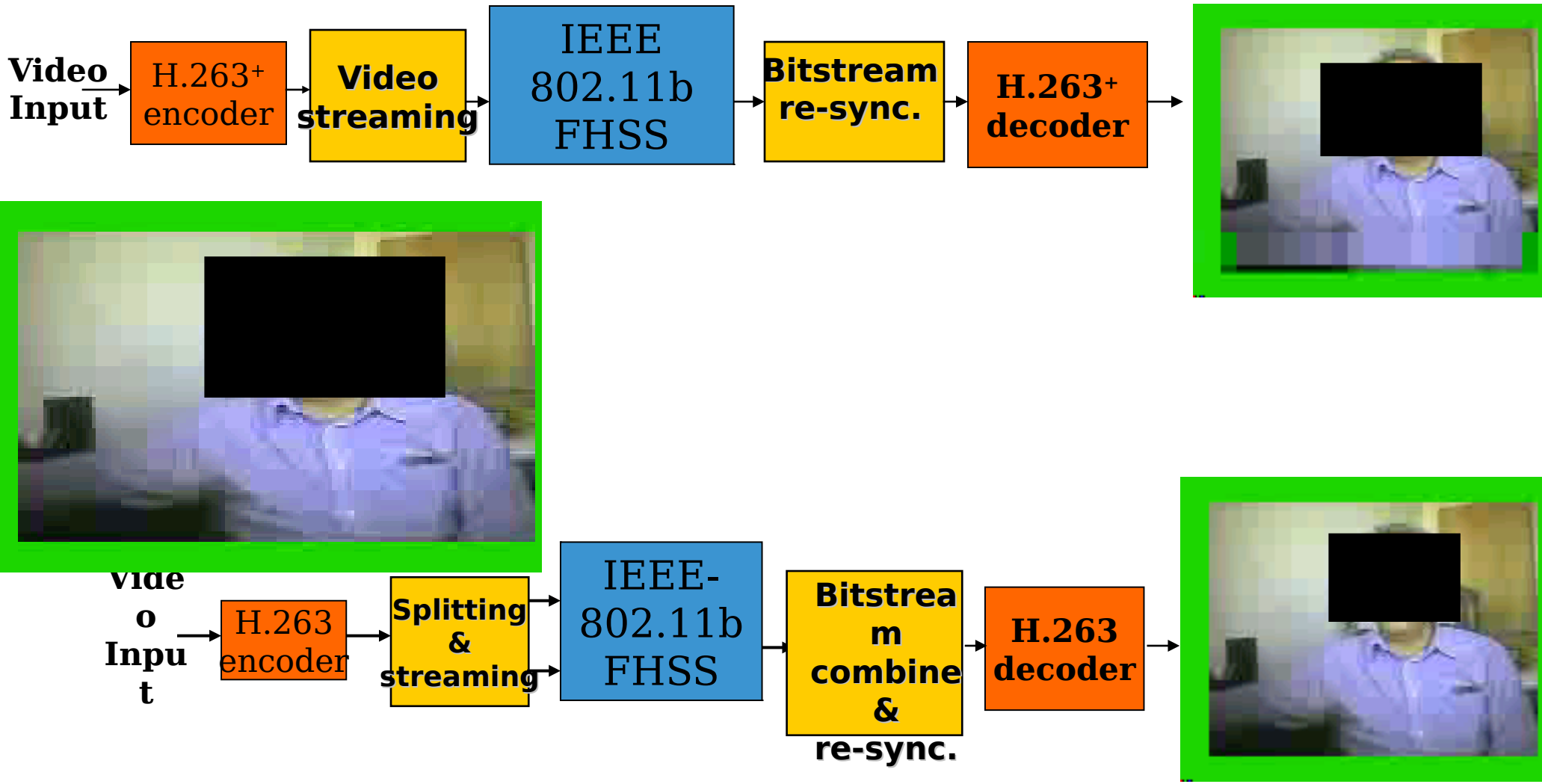
Solutions

- Delivering corrupted packets to the higher layer.
  - Perform packet-loss corrections:
    - Suitable for multicast
    - Unsuitable for conferencing
  - Perform error resilient video decoding by taking advantage of the RTP packet sequencing to detect lost packets

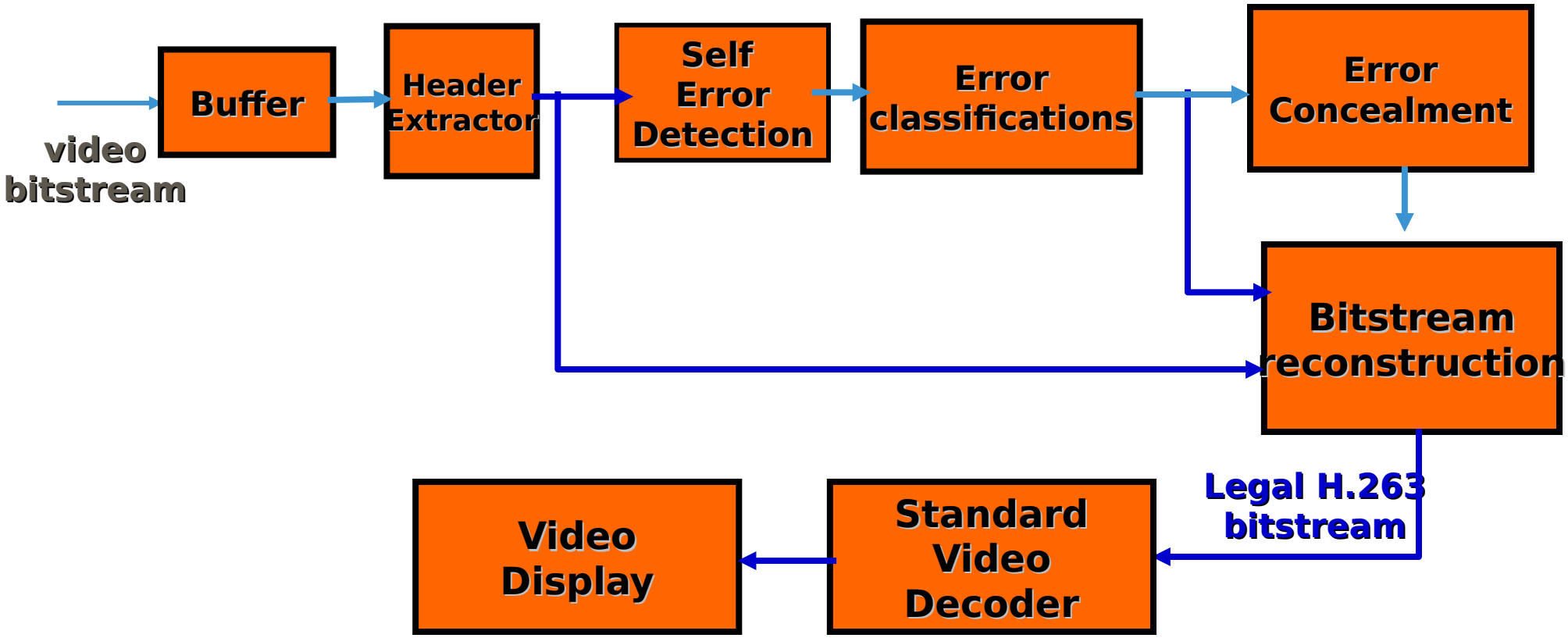
Video Partitioning



Error Resilient H.263 video streaming (SPW Demo)



Pre-Decoder Design
(non-partitioned)



FY’02 tasks

- Complete the 802.11b FHSS implementation for field tests
- Performance evaluations in terms of :
  - Coverage (indoor/outdoor)
  - Mobility
  - Bandwidth
  - Number of nodes
- Further extensions to improve the error resilient decoding of the corrupted bitstream